DOCUMENTATION OF ENVIRONMENTAL INDICATOR DETERMINATION

Interim Final 2/5/99

RCRA Corrective Action
Environmental Indicator (EI) RCRIS code (CA725)

Current Human Exposures Under Control

Facility Name: CDOT Headquarters Materials Testing Laboratory
Facility Address: 4340 East Louisiana Avenue, Denver, CO
Facility EPA ID #: COD 98 095 2097

1. Has **all** available relevant/significant information on known and reasonably suspected releases to soil, groundwater, surface water/sediments, and air, subject to RCRA Corrective Action (e.g., from Solid Waste Management Units (SWMU), Regulated Units (RU), and Areas of Concern (AOC)), been **considered** in this EI determination?

__X__ If yes - check here and continue with #2 below.

_____ If no - re-evaluate existing data, or

_____ if data are not available skip to #6 and enter"IN" (more information needed) status code.

BACKGROUND

Definition of Environmental Indicators (for the RCRA Corrective Action)

Environmental Indicators (EI) are measures being used by the RCRA Corrective Action program to go beyond programmatic activity measures (e.g., reports received and approved, etc.) to track changes in the quality of the environment. The two EI developed to-date indicate the quality of the environment in relation to current human exposures to contamination and the migration of contaminated groundwater. An EI for non-human (ecological) receptors is intended to be developed in the future.

Definition of "Current Human Exposures Under Control" EI

A positive "Current Human Exposures Under Control" EI determination ("YE" status code) indicates that there are no "unacceptable" human exposures to "contamination" (i.e., contaminants in concentrations in excess of appropriate risk-based levels) that can be reasonably expected under current land- and groundwater-use conditions (for all "contamination" subject to RCRA corrective action at or from the identified facility (i.e., site-wide)).

Relationship of EI to Final Remedies

While Final remedies remain the long-term objective of the RCRA Corrective Action program the EI are near-term objectives which are currently being used as Program measures for the Government Performance and Results Act of 1993, GPRA). The "Current Human Exposures Under Control" EI are for reasonably expected human exposures under current land- and groundwater-use conditions ONLY, and do not consider potential future land- or groundwater-use conditions or ecological receptors. The RCRA Corrective Action program's overall mission to protect human health and the environment requires that Final remedies address these issues (i.e., potential future human exposure scenarios, future land and groundwater uses, and ecological receptors).

Duration / Applicability of EI Determinations

EI Determinations status codes should remain in RCRIS national database ONLY as long as they remain true (i.e., RCRIS status codes must be changed when the regulatory authorities become aware of contrary information).

2. Are groundwater, soil, surface water, sediments, or air **media** known or reasonably suspected to be **"contaminated"**[1] above appropriately protective risk-based "levels" (applicable promulgated standards, as well as other appropriate standards, guidelines, guidance, or criteria) from releases subject to RCRA Corrective Action (from SWMUs, RUs or AOCs)?

	Yes	No	?	Rationale / Key Contaminants
Groundwater	X	___	___	TCA, TCE, DCE, DCA, BTEX, PCE and other chlorinated and nonchlorinated compounds above MCLs.
Air (indoors)[2]	X	___	___	Impacts to residents above and adjacent to groundwater plume/ TCA, DCE, TCE and VC(?).
Surface Soil (e.g., <2 ft)	___	X	___	Release from USTs which were removed in 1987.
Surface Water	___	X	___	Plume does not contact surface water.
Sediment	___	X	___	No contaminated sediment at site.
Subsurf. Soil (e.g., >2 ft)	X	___	___	Source area impacts near former USTs, including residual NAPL.
Air (outdoors)	___	X	___	Calculated summed risks to residents and construction workers potentially impacted by exposure to outdoor air were less than one in a million (*BRA, 1998*).

_____ If no (for all media) - skip to #6, and enter "YE," status code after providing or citing appropriate "levels," and referencing sufficient supporting documentation demonstrating that these "levels" are not exceeded.

__X__ If yes (for any media) - continue after identifying key contaminants in each "contaminated" medium, citing appropriate "levels" (or provide an explanation for the determination that the medium could pose an unacceptable risk), and referencing supporting documentation.

_____ If unknown (for any media) - skip to #6 and enter "IN" status code.

Rationale and Reference(s):

Media	Contaminant*	Level of Concern (ug/l)	Max. Detected (ug/l)
Groundwater	TCA	200	95,000
	DCE	7	520,000
	TCE	5	74,000
	PCE	5	2,900
	Benzene	5	990
	DCM	5	2,200,000

Levels of Concern are *CDPHE-WQCC Basic Standards for Groundwater 3.110 (5 CCR 1002-8)*. Maximum detections are in the source area, from Table 2-5 of the *Groundwater Corrective Measures Plan (December 17, 1998)*.

* See *Groundwater Corrective Measures Plan* (Table 2-5) for others.

Media	Contaminant*	Level of Concern (ug/m3)	Max. Detected (ug/m3)
Indoor Air	DCE	0.046	100
	TCE	1.33	96

* See *Baseline Risk Assessment (September 1998)* (BRA) and the *Indoor Air Corrective Measures Plan (September 30, 1998)* (CMP) for additional information. Levels of Concern for indoor air are risk based concentrations (RBCs) based on risk of one in a million for individual chemicals. Interim corrective measures remediation goal is summed risk of 1x10-5. Long-term final clean-up goal is 1x10-6 summed cancer risk.

		(mg/kg)	(mg/kg)
Subsurface Soil	DCE	0.19 (CDPHE industrial PRG)	1.6

Footnotes:

[1] "Contamination" and "contaminated" describes media containing contaminants (in any form, NAPL and/or dissolved, vapors, or solids, that are subject to RCRA) in concentrations in excess of appropriately protective risk-based "levels" (for the media, that identify risks within the acceptable risk range).

[2] Recent evidence (from the Colorado Dept. of Public Health and Environment, and others) suggest that unacceptable indoor air concentrations are more common in structures above groundwater with volatile contaminants than previously believed. This is a rapidly developing field and reviewers are encouraged to look to the latest guidance for the appropriate methods and scale of demonstration necessary to be reasonably certain that indoor air (in structures located above (and adjacent to) groundwater with volatile contaminants) does not present unacceptable risks.

3. Are there **complete pathways** between "contamination" and human receptors such that exposures can be reasonably expected under the current (land- and groundwater-use) conditions?

Summary Exposure Pathway Evaluation Table

	Potential **Human Receptors** (Under Current Conditions)						
"Contaminated" Media	Residents	Workers	Day-Care	Construction	Trespassers	Recreation	Food[3]
Groundwater	yes	yes	no	yes			no
Air (indoors)	yes	yes	no				
~~Soil (surface, e.g., <2 ft)~~	___	___	___	___	___	___	___
~~Surface Water~~	___	___			___	___	___
~~Sediment~~	___	___			___	___	___
Soil (subsurface e.g., >2 ft)				yes			no
~~Air (outdoors)~~	___	___	___	___	___		

Instructions for Summary Exposure Pathway Evaluation Table:

1. Strike-out specific Media including Human Receptors' spaces for Media which are not "contaminated") as identified in #2 above.

2. enter "yes" or "no" for potential "completeness" under each "Contaminated" Media -- Human Receptor combination (Pathway).

Note: In order to focus the evaluation to the most probable combinations some potential "Contaminated" Media - Human Receptor combinations (Pathways) do not have check spaces ("___"). While these combinations may not be probable in most situations they may be possible in some settings and should be added as necessary.

_____ If no (pathways are not complete for any contaminated media-receptor combination) - skip to #6, and enter "YE" status code, after explaining and/or referencing condition(s) in-place, whether natural or man-made, preventing a complete exposure pathway from each contaminated medium (e.g., use optional Pathway Evaluation Work Sheet to analyze major pathways).

_X_ If yes (pathways are complete for any "Contaminated" Media - Human Receptor combination) - continue after providing supporting explanation.

_____ If unknown (for any "Contaminated" Media - Human Receptor combination) - skip to #6 and enter "IN" status code

Rationale and Reference(s):

Residents via contaminated:
-Groundwater is a potentially complete pathway from the inhalation of vapors during garden irrigation. Drinking water is supplied by a municipal water supply. Dermal contact with groundwater is a pathway that has low risk.
-Indoor air is a complete pathway. Single family residences and apartments located over and adjacent to the groundwater plume have been impacted. Prior to remediation, calculated 95% UCL summed risks exceeded the

Interim Action Level of 1x10-5 in several apartment buildings and single family dwellings. In each, indoor air remediation systems have been installed and the post-remediation data are below the Interim Action Level.

Workers via contaminated:
-Groundwater from the inhalation of vapors during landscaping irrigation.
-Indoor air is a complete pathway for a commercial worker such as an building manager for those apartments located over the plume. Results of the 95% UCL summed risk calculation for commercial workers exposed to contaminated indoor air indicated that the pre-remediation risk exceeded the 1x10-5 Interim Action Level at seven apartment buildings. Remediation systems have been installed and post-remediation data are below 1x10-5. For workers at the MTL, the workplace indoor air is within Federal and Industry standards for commercial workers who are informed, trained, and protected concerning the use of such hazardous materials. Measured indoor air concentrations at the MTL are also below the 1x10-5 Interim Action Level established for off-site residents and commercial workers.

Daycare:
No daycares, hospitals, schools, etc located over or immediately adjacent to CDOT contaminant plume or contaminated soil.

Construction worker via contaminated:
-Groundwater is a complete pathway due to possibility that a construction worker may contact water when undertaking construction activities. Inadvertent ingestion and dermal contact of groundwater while trenching are pathways that have low risk. Calculated risk for a construction worker inhaling vapors from an irrigation (dewatering) system exceeds the Interim Action Level of 1x10-5. This is a hypothetical exposure and no actual exposures have occurred or are anticipated, but an institutional control may be needed to control this potential exposure until groundwater has been remediated.
-Subsurface soil and soil vapors is a complete pathway which can be reasonably expected due to construction related to excavation, trenching, and utility maintenance, etc.

Food:
No food is grown in contact with contaminated subsurface soil. It is unlikely that food items (e.g. fruit trees) are grown in contact with contaminated groundwater, as the depth to water beneath impacted residences typically ranges from 10 to 20 feet or deeper, though in a few locations it can be as shallow as 7 feet.

[3] Indirect Pathway/Receptor (e.g., vegetables, fruits, crops, meat and dairy products, fish, shellfish, etc.)

4 Can the **exposures** from any of the complete pathways identified in #3 be reasonably expected to be **"significant"**[4] (i.e., potentially "unacceptable" because exposures can be reasonably expected to be: 1) greater in magnitude (intensity, frequency and/or duration) than assumed in the derivation of the acceptable "levels" (used to identify the "contamination"); or 2) the combination of exposure magnitude (perhaps even though low) and contaminant concentrations (which may be substantially above the acceptable "levels") could result in greater than acceptable risks)?

_____ If no (exposures can not be reasonably expected to be significant (i.e., potentially "unacceptable") for any complete exposure pathway) - skip to #6 and enter "YE" status code after explaining and/or referencing documentation justifying why the exposures (from each of the complete pathways) to "contamination" (identified in #3) are not expected to be "significant."

__X__ If yes (exposures could be reasonably expected to be "significant" (i.e., potentially "unacceptable") for any complete exposure pathway) - continue after providing a description (of each potentially "unacceptable" exposure pathway) and explaining and/or referencing documentation justifying why the exposures (from each of the remaining complete pathways) to "contamination" (identified in #3) are not expected to be "significant."

_____ If unknown (for any complete pathway) - skip to #6 and enter "IN" status code

Rationale and Reference(s):

The complete or potentially complete pathways identified in #3 are:

-Resident and Groundwater: While some residents may conduct gardening using irrigation wells and be exposed from the inhalation of vapors during spray irrigation, these exposures are not reasonably expected to be significant because 1) the duration and intensity of these exposures is likely very low and 2) the concentration of contaminants will be diluted by and dispersed in the outdoor airshed. This pathway will be quantitatively assessed in the revised BRA and this determination will be updated, if needed, based on the results.

-Resident and Indoor Air: As noted under #3, residents in both single family homes and apartment buildings have historically been impacted. Current (interim) remediation action levels are summed risk of 5x10-6 (using DCE, the primary contaminant, as a surrogate) and all homes above this level are being remediated. However, impacts in the range of 5x10-6 and 1x10-6 summed risk are also considered significant and will be addressed in the long-term remedy (as presented in the Indoor Air CMP currently under revision).

-Worker and Groundwater: Potential exposure of maintenance workers or landscapers from inhalation of vapors during spray irrigation may be unacceptable. This exposure scenario, when calculated for the construction worker and assuming a 60 day exposure duration, exceeded the interim action level of 1x10-5. This is a hypothetical exposure and no actual exposures are anticipated but an institutional control may be required. The risk will be assessed for a groundskeeper in the revised BRA using a 6 month exposure duration.

-Worker and Indoor Air: As noted under #3, indoor air is a complete pathway for building managers for those apartments located in the vicinity of the plume. Current (interim) remediation action levels are summed risk of 5x10-6 (using DCE, the primary contaminant, as a surrogate) and all apartment buildings above this level are being remediated. However, impacts in the range of 5x10-6 and 1x10-6 summed risk are also considered significant and

will be addressed in the long-term remedy (as presented in the Indoor Air CMP currently under revision).

-Construction Worker and Groundwater: Potential exposure of a construction worker from inhalation of vapors during spray irrigation may be unacceptable. This exposure scenario, when calculated assuming a 60 day exposure duration, exceeded the interim action level of 1x10-5. This is a hypothetical exposure and no actual exposures have occurred or are anticipated, but an institutional control may be needed to control this potential exposure until groundwater has been remediated.

-Construction Worker and Subsurface Soil: Soil concentrations exceed levels of concern only in the source area on CDOT property, where maximum soil DCE concentrations exceed the CDPHE industrial soil PRG for dermal and ingestion exposure pathways. However these exposures are not expected to be reasonably significant due to low duration of exposure, and institutional controls are or will be in place to control or manage intrusive activities.

The summed risk for inhalation of COC from soil by a construction worker was evaluated in the BRA and found to be low, 5.49x10-6. However, this was for off-site exposures. This risk will be calculated for onsite construction workers in the revised BRA. However these exposures are not expected to be reasonably significant due to low duration of exposure, and institutional controls are or will be in place to address potential risk.

[4] If there is any question on whether the identified exposures are "significant" (i.e., potentially "unacceptable") consult a human health Risk Assessment specialist with appropriate education, training and experience.

5 Can the "significant" **exposures** (identified in #4) be shown to be within **acceptable** limits?

__X__ If yes (all "significant" exposures have been shown to be within acceptable limits) - continue and enter "YE" after summarizing and referencing documentation justifying why all "significant" exposures to "contamination" are within acceptable limits (e.g., a site-specific Human Health Risk Assessment).

_____ If no (there are current exposures that can be reasonably expected to be "unacceptable")- continue and enter "NO" status code after providing a description of each potentially "unacceptable" exposure.

_____ If unknown (for any potentially "unacceptable" exposure) - continue and enter "IN" status code

Rationale and Reference(s):

A *Baseline Risk Assessment (September 1998)* has been prepared for the site. Current indoor air exposures are under control in that all residences or apartment buildings that exceed a summed risk of 5x10-6 (using DCE as a surrogate) are being remediated. Remediation systems are operated, maintained, and monitored on a routine basis and indoor air verification sampling is conducted bimonthly to quarterly to ensure that performance goals are met.

In the revised Indoor Air CMP, the long-term cleanup goal will be 1x10-6 summed risk and will be coupled with remediation of the distal groundwater plume.

6. Check the appropriate RCRIS status codes for the Current Human Exposures Under Control EI event code (CA725), and obtain Supervisor (or appropriate Manager) signature and date on the EI determination below (and attach appropriate supporting documentation as well as a map of the facility):

__X__ YE - Yes, "Current Human Exposures Under Control" has been verified. Based on a review of the information contained in this EI Determination, "Current Human Exposures" are expected to be "Under Control" at the **CDOT Headquarters MTL** facility, EPA ID **#COD 98 095 2097**, located at **Denver, Co**, under current and reasonably expected conditions. This determination will be re-evaluated when the Agency/State becomes aware of significant changes at the facility.

____ NO - "Current Human Exposures" are NOT "Under Control."

____ IN - More information is needed to make a determination.

Completed by (signature) Teresa J. Bennett Date 5/15/00
(print) Teresa J. Bennett
(title) Environmental Protection Specialist

Supervisor (signature) [signature] Date 6-13-00
(print) Walter Avramenko
(title) Unit Leader, Hazardous Waste Cleanup and Permitting Unit
(EPA Region or State) Colorado

Locations where References may be found:

Colorado Department of Public Health and Environment
Hazardous Materials and Waste Management Division
HMWMD-B2, Records Center
4300 Cherry Creek Drive South
Denver, CO 80246-1530

Contact telephone and e-mail numbers

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FINAL NOTE: THE HUMAN EXPOSURES EI IS A QUALITATIVE SCREENING OF EXPOSURES AND THE DETERMINATIONS WITHIN THIS DOCUMENT SHOULD NOT BE USED AS THE SOLE BASIS FOR RESTRICTING THE SCOPE OF MORE DETAILED (E.G., SITE-SPECIFIC) ASSESSMENTS OF RISK.